CLAIMS

1. A method of controlling an arc welding system during a welding process having a plurality of welding cycles in which a consumable electrode is advanced towards a workpiece, said method including dynamically regulating a rate of advancement and instantaneous melt rate of said electrode during each welding cycle in response to predetermined events occuring during said welding process.

2. A method according to claim 1 including coordinating said melt rate with said rate of advancement of said electrode.

3. A method according to claim 1 or 2 including controlling a source of power supplied to said consumable electrode.

4. A method according to claim 3 wherein said source of power includes a current waveform.

5. A method according to any one of the preceding claims including monitoring a feedback signal associated with said welding process.

6. A method according to claim 5 wherein said feedback signal includes voltage.

7. A method according to claim 6 wherein said feedback signal includes current.

8. A method according to any one of the preceding claims including sampling in real time conditions associated with said welding process to obtain information for identifying said predetermined events.

9. A method according to claim 8 including processing said information to obtain a first reference signal for regulating said rate of advancement of said electrode.

10. A method according to claim 8 or 9 when appended to claim 2 including processing said information to obtain a second reference signal for controlling said melt rate of said electrode.

11. A method according to any one of the preceding claims wherein said welding process uses a shielding gas.

12. A method according to claim 11 wherein said shielding gas includes $CO_2$.

13. A method according to any one of the preceding claims wherein said welding system operates in a dip transfer mode wherein each welding cycle includes an arcing phase during which said electrode is spaced from said workpiece and an arc is generated across said space, said arc being operative to form a molten droplet on the end of said electrode, and a short circuit phase during which said electrode is in contact with said workpiece, each welding cycle changing from said arcing phase to said short circuit phase on contact of said molten droplet with said workpiece, and changing from said short circuit phase to said arcing phase after rupturing of a bridge of molten material formed between said electrode and said workpiece.

14. A method according to claim 13 including conditioning the welding system to form a molten droplet on the electrode end during the arcing phase which has a diameter greater than the diameter of the electrode, and causing the droplet to detach from the electrode after the molten droplet has come into contact with the workpiece to thereby ensure a short circuit and arcing phase occurs in each welding cycle.

15. An arc welding system including a power source, a control unit and means for advancing a consumable electrode towards a workpiece during a welding process, said consumable electrode being energized by said power source to cause said electrode to supply molten material to said workpiece, wherein said means for advancing is controlled by said control unit to dynamically regulate a rate of advancement of said electrode in response to predetermined events occurring during said welding process.

16. A welding system according to claim 15 wherein said power source is controlled by said control unit in response to said predetermined events to control an instantaneous melt rate of said electrode.

17. A welding system according to claim 16 wherein said control unit is adapted to coordinate said melt rate with said rate of advancement of said electrode.

18. A welding system according to any one of claims 15 to 17 including means for obtaining a feedback signal associated with said welding process.

19. A welding system according to claim 18 wherein said feedback signal includes voltage.

20. A welding system according to claim 19 wherein said feedback signal includes current.

21. A welding system according to any one of claims 15 to 19 wherein said control unit is adapted to sample in real time conditions associated with said welding process to obtain information for identifying said predetermined events.

22. A welding system according to claim 21 wherein said control unit is adapted to process said information to obtain a first reference signal for regulating said rate of advancement of said electrode.

23. A welding system according to claim 21 or 22 when appended to claim 15 wherein said control unit is adapted to process said information to obtain a second reference signal for controlling said melt rate of said electrode.

24. A welding system according to any one of claims 15 to 23 wherein said welding process uses a shielding gas.

25. A welding system according to claim 24 wherein said shielding gas includes $CO_2$.

26. A welding system according to any one of claims 15 to 25 wherein said welding system operates in a dip transfer mode over a plurality of welding cycles wherein each welding cycle includes an arcing phase during which said electrode is spaced from said workpiece and an arc is generated across said space, said arc being operative to form a molten droplet on the end of said electrode, and a short circuit phase during which said electrode is in contact with said workpiece, each welding cycle changing from said arcing phase to said short circuit phase on contact of said molten droplet with said workpiece, and changing from said short circuit phase to said arcing phase after rupturing of a bridge of molten material formed between said electrode and said workpiece.

27. A welding system according to claim 26 including means for conditioning said welding system to form a molten droplet on the electrode end during the arcing phase which has a diameter greater than the diameter of the electrode, and means for causing the droplet to detach from the electrode after the molten droplet has come into contact with the workpiece to thereby ensure a short circuit phase occurs in each welding cycle.

28. A method of controlling an arc welding system substantially as herein described with reference to the accompanying drawings and/or examples.

29. A welding system substantially as herein described with reference to the accompanying drawings and/or examples.